ANDREW SAFETY APPLIANCE

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ANDREW SAFETY APPLIANCE.

SUBCOMMITTEE OF THE
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
HOUSE OF REPRESENTATIVES,
Wednesday, January 15, 1913.

The subcommittee met at 10 o'clock a. m., Hon. Courtney W. Hamlin (chairman) presiding.

The CHAIRMAN. I want to make this statement, so the record will show that some time ago Mr. Andrew appeared before this subcommittee and submitted an amended, or new device, which he thought perhaps would meet the objections made to the invention he first submitted. He explained the new device, and to-day, I take it, you will confine your references to this new device.

Mr. FAULKNER. That is the purpose of all these witnesses, Mr. Chairman.

The CHAIRMAN. All right, then; you may proceed.

STATEMENT OF MR. A. S. VOGT.

Examination by Mr. S. C. NEALE, attorney for the Pennsylvania Railroad Co.:

Mr. NEALE. How long have you been connected with the Pennsylvania Railroad?

The CHAIRMAN (interrupting). Mr. Neale, as Mr. Hamilton was not present at the last hearing, will you please have him give his name and occupation?

Mr. NEALE. All right, sir. Please state that, Mr. Vogt.

Mr. VOGT. A. S. Vogt, mechanical engineer, Pennsylvania Railroad Co.

Mr. NEALE. And how long have you been connected with the Pennsylvania Railroad?

Mr. VOGT. Since 1874.

Mr. NEALE. At the meeting of this subcommittee last May you stated that you had examined the patent then secured by Mr. Andrew?

Mr. VOGT. Yes, sir

Mr. NEALE. And you pointed out in your own way at that time what you thought of the practicability of his device?

Mr. VOGT. Yes, sir.

Mr. NEALE. Have you, since last May, examined the new patent secured by Mr. Andrew?

Mr. VOGT. I have; yes, sir.

Mr. NEALE. And will you kindly state to the subcommittee what you think about its practicability or impracticability?

Mr. VOGT. I am not able to say, after examining his new device, that it alters my previous statement. It does not change the conditions, so far as I can see. The scheme, I think, is impracticable.

Mr. NEALE. Why?

Mr. VOGT. For the reason that the so-called safety wheels are forced against the inside of the running wheels, and are simply held there by force, or by pressure, which is produced by a sleeve or clamp, if you may call it that. Now, if you take the case of cast-iron wheels, it is impossible to machine the inside of the back of that wheel, and that is the place where the so-called safety wheel is to fit. If it does not fit it will soon rattle loose, and it is impossible to make it fit there.

The CHAIRMAN. As I understand this new device of Mr. Andrew's, he proposes to fasten his wheels on the inside of those wheels?

Mr. VOGT. It will have no other fastening, except the pressure brought to bear upon the two parts by that clamp or sleeve in the center.

The CHAIRMAN. But they are to work immediately on the inside of those wheels, and to be kept up against them?

Mr. VOGT. Yes, sir; on the inside faces of the wheels, and are apparently made with a flange to come in here [indicating on patent drawing], so as to hold these projections, or whatever you choose to call them. But the flange of the safety wheels must come between these ribs, and consequently you can not fasten to the inside of running wheels; you could finish the outside of the safety wheel, but you can not finish this [indicating on model].

Mr. ANDREW. May I ask the gentleman to let me see that model?

Mr. VOGT. Certainly.

Mr. ANDREW. I would like to call your attention——

The CHAIRMAN (interrupting). Let him finish his statement first, and then you can ask him questions.

Mr. ANDREW. I just wanted to ask this one question right here, or call his attention to this fact: That is too small a wheel to demonstrate this with; this axle through here, made of this little wire, is entirely too small to consider with a wheel of that size; it is too small——

Mr. VOGT. It will serve my purpose to call your attention to this one fact——

Mr. NEALE. I think, Mr. Chairman, it would be better to allow Mr. Vogt to finish his statement, and then Mr. Andrew can cross-examine him if he wants to.

The CHAIRMAN. I think so. Go ahead, Mr. Vogt.

Mr. VOGT. I will try to illustrate more fully. Here is a blue print of a full size, standard cast-iron wheel, just as used by the thousands on railways of this country. This [indicating] shows the bracket where it comes out under the back of the wheel, back of the tread and the flange. I think that is clear, is it not? Now, that shows the impossibility of machining this so as to make the so-called safety wheels fit in there; it has got to stay or else it will rattle loose and be a menace to the train that carries it, or rather to the car that carries it. This [indicating] is to form a bracket, just as shown by the model; this is a cross section through here somewhere.

Now, at a previous hearing which I attended we were speaking of the deflection of the axle. Mr. Ettenger here has very kindly made

this little model. But, of course, in order to show how the deflection takes place we have to have some weight on the ends. Just to try and illustrate this, we will take this little stick and put it between the flanges. There is no load on the journals, therefore the stick stays; now, I put a load on the journals, out here [indicating], and up she comes, because the axle is deflected. Now, with that deflection which necessarily must take place under any and all circumstances in some portion of the axle, which is not intended to carry such a stress, I can not see how the device can work satisfactorily and safely.

So, I say that I don't think this new device, as patented and shown by No. 1043559, alters the condition at all. The axle must deflect and these wheels move out, and that takes place all the time. There must be running way.

Mr. STEVENS. You don't think there is any method of adjusting it by which it can not work loose?

Mr. VOGT. If you bring force enough on that sleeve with the conical ends so as to force those two so-called safety wheels against the inside of the running wheels, you stand every chance of forcing the wheels off the axle. And if this device is strong enough and rigid enough it will have the same tendency to force the wheels off the axle, because when the wheels are brought together at bottom it has a tendency to force the wheels out. They are only pressed on there; they are not fastened in any way, except by friction due to pressure.

The CHAIRMAN. This device forms a sort of jacket over the wheels, doesn't it?

Mr. VOGT. Yes, sir.

The CHAIRMAN. Would that not tend to prevent this deflection, or lessen it, by strengthening the axle?

Mr. VOGT. You will be overstraining the axle. The axle must have room to deflect; you can't help it.

Mr. NEALE. Then, Mr. Vogt, after carefully examining that new patent and comparing the new with the old pattern, as a mechanical engineer of many years' experience, you are perfectly clear on that point and believe that the new patent is impracticable.

Mr. VOGT. I do.

Examination by former Senator CHARLES J. FAULKNER, representing various railroad companies:

Mr. FAULKNER. I would like to go a little further into this opinion of Mr. Vogt's, on page 2, that third paragraph there.

Mr. VOGT. Oh; of that last report.

Mr. FAULKNER. That is, regarding the safety of the thing—whether it will stay or not?

Mr. VOGT. I do not think it will.

Mr. FAULKNER. That is your judgment?

Mr. VOGT. Yes, sir; it will not stay for any length of time.

The CHAIRMAN. You mean that it will not remain intact?

Mr. VOGT. Yes, sir; I mean that it will work loose.

The CHAIRMAN. Have you any other reasons to give than those you have given?

Mr. VOGT. Because of that deflection.

The CHAIRMAN. Have you any additional reasons?

Mr. VOGT. No, sir; those are the reasons—in the main. Wear must take place as a result of the deflection, and as soon as that takes place the distance between those two must shorten, or in here [indicating on model] in the center where the clamp comes; these surfaces will soon wear and the thing will be loose, and as soon as it is loose it will be gone—just a question of time.

Mr. FAULKNER. The more that deflection takes place—would that cause a stronger pressure to be exerted against the wheels and throw them out?

Mr. VOGT. Yes, sir; that is what I attempted to explain. It has a tendency to force the running wheels off the axle.

Mr. FAULKNER. When running with a load what is the difference between the distance between the top of the two wheels and the distance between the bottoms of the two wheels?

Mr. VOGT. I could not tell you, as I have never measured that distance; but I believe it is from one-sixteenth to one-eighth of an inch.

Mr. FAULKNER. And this was demonstrated by you when you put the pencil between them, and when the pressure was put on the journal it fell?

Mr. VOGT. Yes, sir.

Mr. FAULKNER. And that shows that they do come closer together at the bottom than at the top; is that right?

Mr. VOGT. Yes, sir.

Mr. FAULKNER. And with this new plan, would the effect be to press stronger outward on both wheels?

Mr. VOGT. It would, certainly, sir; at the bottom.

Mr. FAULKNER. At the bottom?

Mr. VOGT. Yes, sir.

Mr. STEVENS. Press against what?

Mr. FAULKNER. Against the running wheels on which they were running.

The CHAIRMAN. Any further questions, Mr. Neale?

Mr. NEALE. No, sir; I have nothing more.

Mr. ANDREW. I would like to ask a question, Mr. Chairman.

The CHAIRMAN. Just a minute, Mr. Andrew.

Mr. FAULKNER. Mr. Vogt, I would like to have you look at page 12 of the hearing of December 17, just at the close of Mr. Andrew's statement, where he says [reading]:

> It is the same work, but it is on the inside of that frame instead of on the outside of the frame of the engine between the wheels. I have all the room in the world that I need, without interfering with the air-brake system. The closer the work is the better I like it, the less expense to me, and the better I can strengthen the frame of that engine.

Will you state whether you concur with him in that?

Mr. VOGT. No, sir; I do not. You can put the attachment for those rollers on the inside of the engine frame; there would be no trouble about that; but you have to carry those rollers out beyond the frame; they have to come between the driving wheels; they have to come through there so as to have the rollers outside of the driving wheels, and there is where we get into trouble, because that is the space occupied by the driver brake.

Mr. FAULKNER. Well, does this device now produced here change the view that you expressed formerly of the inability of the present modern engine to take this device under there?

Mr. VOGT. It does not alter my views in any respect whatever.

Mr. FAULKNER. The impossibility of putting them on modern engines is the same with this as with the other one?

Mr. VOGT. Yes, sir.

Mr. FAULKNER. And the question of safety, in your opinion—has that increased or decreased?

Mr. VOGT. Decreased.

Mr. FAULKNER. Decreased?

Mr. STEVENS. That is, as to the locomotive?

Mr. VOGT. As to the locomotive, for one thing, because in order to put the so-called safety wheels outside the driving wheels there has to be a safety wheel on this side as well as on that side, both on the outside and on the inside. In order to get that bar, or whatever attachment is used, upon which to place those wheels, through the space between the driving wheels you would have to use the space occupied by the driver brakes. You can't take them away; if you do you will destroy the safety of the whole machine.

Mr. STEVENS. Doesn't Mr. Andrew contend that there is space there for his device?

Mr. VOGT. He does. There was on his locomotive down there, but that was an old-fashioned type of locomotive. As a matter of fact, this is all laid out on our drawings of a modern type of locomotive, showing exactly what would have to be done. I sent those drawings to Mr. Stewart.

Mr. STEWART. I think the committee has those drawings.

Mr. FAULKNER. Yes, sir; I left them with the committee.

Mr. VOGT. Two different things would have to be occupying the same space at the same time, and that is rather a difficult thing to accomplish.

Mr. STEVENS. How much space is now unoccupied when the driver brakes are on?

Mr. VOGT. There is generally an inch between the flanges and the two adjacent wheels on a modern locomotive; that means 3 inches from the tread of one wheel to the tread of the other. The space down here below between the rail [indicating] and the two pairs of wheels is the space occupied by the driver-brake mechanism.

Mr. HAMILTON. What is the length of the base of that triangle on the track?

Mr. VOGT. Well, say, with a 72-inch wheel—that is, 6 feet—that would be the distance from the center of one wheel to the center of the other—approximately 6 feet, 3 inches. Of course, that would be 3 inches between the tread of the two wheels with a driver 6 feet in diameter.

The CHAIRMAN. You mean that there is only about an inch space between the flange of one wheel and the wheel just immediately in front of it?

Mr. VOGT. Yes, sir; that is all; or between the treads of the wheels, as we call it, 3 inches.

Mr. NEALE. We are through, sir.

Mr. VOGT. Yes, sir; one pair of drivers has this space [indicating] on drawing].

The CHAIRMAN. That is the old type?

Mr. VOGT. Yes, sir; one pair of drivers has this space [indicating], and the other pair of drivers that space.

The CHAIRMAN. Now, this is the flange, and that is the wheel in front, and this space is only about an inch?

Mr. VOGT. An inch; yes, sir. Here is the space occupied by this, and that comes right in here.

The CHAIRMAN. Well, then, why not in this space?

Mr. VOGT. That space [indicating] is occupied by the brake mechanism—that is, the hanger by which this brake shoe is carried—and that comes down to this lever so it can take hold of it.

Mr. HAMILTON. I suppose in the question I asked I did not make my meaning clear. What I meant by the use of the word "triangle" was the triangle formed by the rims of these wheels and the rail, with an idea of knowing what the distance up here between the flanges was, which you said was about an inch or an inch and a half.

Mr. VOGT. About an inch.

Mr. HAMILTON. I just wanted to know what this distance was, so as to know something about what space you have there.

Mr. VOGT. This is an illustration of it.

Mr. HAMILTON. I see.

The CHAIRMAN. What is the average space actually taken up by this brake here; do you know?

Mr. VOGT. It is very much the same in all cases. In this case it happens to be about 14 inches.

The CHAIRMAN. And the whole distance across there was what?

Mr. VOGT. Right across here, from flange to flange? About 17 inches.

The CHAIRMAN. So there is about 3 inches of space left?

Mr. VOGT. There is below here a space of about 6½ inches.

The CHAIRMAN. Between the rail and the under side of the mechanism?

Mr. VOGT. Yes, sir.

Mr. HAMILTON. How much space; 7 inches?

Mr. VOGT (taking measurement on blue print). Six and three-quarters.

The CHAIRMAN. Then the brake mechanism is 6¾ inches above the rail?

Mr. VOGT. Yes, sir; above the rail.

Here is another type, the conditions being just the same. This is 72½ inches, but the conditions are just the same, but naturally they come a little higher than the other; there is a space there of 8½ inches, but the distance between the flanges is the same.

This is what we are facing: We dare not come too close to the rail, because the engine and its frame is carried on springs in which a change is taking place all the time; they become flatter and flatter as time goes on; also, the tires of the wheels wear out; we start out with a tire 3½ or 4 inches thick, and after awhile it is only 2 inches thick.

Mr. HAMILTON. And that brings your brake mechanism that much nearer the track?

Mr. VOGT. Exactly; and it will bring this safety mechanism, or whatever it may be called, that much nearer the track. We should also remember that trains are not always running over a straight track; they are sometimes passing over crossings and switches and around curves.

The CHAIRMAN. Now, Mr. Andrew, if you want to ask any questions.

Examination by Mr. J. T. ANDREW:

Mr. ANDREW. Now, Mr. Vogt, I believe you stated that in putting this safety wheel on, in making this cone in here, where I apply this knuckle down here in the center, that when I screw this knuckle down it had a tendency to push these wheels out?

Mr. VOGT. Yes, sir.

Mr. ANDREW. Is it not a fact that this latest device of mine is made in six parts, on the inside there?

Mr. VOGT. Yes, sir.

Mr. ANDREW. What would be my reason for trying to crowd that out when all in the world I had to do, with just these two wheels, was to have them fit nicely inside?

Mr. VOGT. I don't know what your reason would be.

Mr. ANDREW. Now, Mr. Vogt, we want results; that is all. I am not antagonistic toward you, and I don't want you to feel that way toward me. All I am trying to do is to make it clear to the gentlemen of this committee, who are not technical people, just what we are after. All in the world I want to make clear to these gentlemen is the intent and purpose of this invention, and to show them that it will do just exactly what we claim for it. Now, is it not possible that we can make this so it will slip into this wheel [indicating on patent drawing], and the same over here, and then secure these two parts down together very securely, not only to the hub of that wheel, but so we can also join it right there and through here, and to the axle itself? See here, Mr. Stevens, that goes to that point right here [indicating]. We claim that we can screw that together, making a complete circuit around inside of the regular wheel.

The CHAIRMAN. What have you in your device to hold your special wheel to this wheel here [indicating]?

Mr. ANDREW. I clamp that wheel and this wheel to the axle here, and to the hub of this wheel here; it is made to fit right there.

The CHAIRMAN. This little shoulder runs out there?

Mr. ANDREW. Yes, sir; that shoulders here, and in here, and clamps to this axle here. Now, mind you, if I don't have anything in there the tendency would be to slip off, would it not? Do you see that, Mr. Stevens? If I don't have that shoulder in here the tendency, when I clamp that here, would be to slip inward.

Mr. STEVENS. It works inside?

Mr. ANDREW. Yes, sir, exactly; the tendency to work inside that way would cause it to fall in, perhaps to here; but, when I put these two parts together [indicating], and these two parts together, that makes four parts.

Mr. STEVENS. I see.

Mr. ANDREW. Then I bring this shoulder, which is bolted to these two parts; it is never made intentionally to fit in such a way that it will crowd these wheels, but it is just a nice, snug fit; but at the same time when it comes down to here that axle and that point there is not deflected; it is made secure. It is dovetailed into this point here, which is to keep these points from slipping toward it, and this is only to lock it, so this axle can deflect where it must deflect.

The CHAIRMAN. Let me ask you this: Does this jacket in between these two parts here fit closely on the axle, or does it give the axle plenty of room to deflect?

Mr. ANDREW. You can make it fit there to this point [indicating] or closer to the axle and keep these parts from dropping in.

Mr. FAULKNER. Well, what question are you going to ask Mr. Vogt?

Mr. ANDREW. If it were not possible for me to fit this in such a way here that it would not have a tendency to drive the axle and at the same time allow for that little deflection.

Mr. VOGT. Not the two combined.

Mr. ANDREW. What is the deflection?

Mr. VOGT. It was enough to drop that stick.

Mr. ANDREW. On this little wire it is [indicating axle of model wheels].

Mr. VOGT. But even on a car.

Mr. ANDREW. I don't think so.

Mr. VOGT. It's a fact.

Mr. FAULKNER. What is your intention about the deflection? Do you intend to allow for a deflection, or do you not intend to allow for it?

Mr. VOGT. My dear sir, if I put my finger here on this table, it yields; if you had means for measuring it, you would find that it does.

Mr. ANDREW. Then I am supplying a proposition which will allow for that deflection and at the same time will lock that wheel. He says it will not; I say it will.

I want results; you gentlemen here are after results; we are after finding these things; and another thing, Mr. Vogt——

Mr. VOGT. Yes, sir.

Mr. ANDREW. Here you are, sir; you say it is impossible for me to put this through. Now, there is a modern engine [exhibiting drawing].

Mr. VOGT (looking at drawing). That proves nothing to me; it is not drawn to scale.

Mr. HAMILTON. It seems to me it must be almost impossible for this stenographer to get all this straight. This all ought to be questions and answers and proceeded with with a little more deliberation.

The CHAIRMAN. That is right.

Mr. ANDREW. Wait a minute, Mr. Vogt, I am not through with you, yet. I would like to have you examine this and see whether or not we can put that on a modern engine and not move your brake mechanism.

Mr. VOGT (again examining drawing). This is drawn entirely out of proportion; it shows nothing but a picture. Those plans there [indicating blue prints] are drawn to scale.

Mr. ANDREW. Then just come up here and we will have a look.

Mr. VOGT. This is nothing but a patent office drawing; it proves nothing at all, it is not drawn to scale.

Mr. ANDREW. Well, here you are, sir; come right up here and look at these blue prints.

The CHAIRMAN. You will have to make your questions, Mr. Andrew, so the stenographer can get them in the record correctly; just

pointing from place to place on the drawing doesn't mean much in the record.

Mr. ANDREW. All right, sir. No, this is a brake here, is not, Mr. Vogt?

Mr. VOGT. Yes, sir.

Mr. ANDREW. And here is the brake beam that operates this brake; there is the brake shoe, and the rods that operate it are here.

Mr. VOGT. Yes, sir.

Mr. ANDREW. What is the height between the rail and those rods?

Mr. VOGT. We have to be governed by the shortest distance which, in this case, is 8½ inches.

Mr. ANDREW. Now, Mr. Vogt, what are those rods for?

Mr. VOGT. They operate the brake mechanism.

Mr. ANDREW. And where do they run?

Mr. VOGT. Right through the middle, there [indicating].

Mr. ANDREW. This runs in the center?

Mr. VOGT. Yes; on the inside of the frame. They are the rods by means of which the load is applied to the brake shoes. Back here [indicating] is placed an air cylinder which receives pressure from the general brake system. That [indicating] operates a lever that pulls on these rods and places the brake shoe pressure on the drivers.

Mr. ANDREW. From this inside frame of this engine through in between this point [indicating] and out, right through here?

Mr. VOGT. That is just what you can not do.

Mr. ANDREW. I can not do it?

Mr. VOGT. No, sir.

Mr. STEVENS. How much space do you want there?

Mr. ANDREW. Eight inches.

Mr. VOGT. That is all the space which is available from the top of the rail to the lowest point of the hanger of the brake.

The CHAIRMAN. Well, what is the point of difference between you?

Mr. ANDREW. The only difference between us is this: There is a 2½-inch rod there which operates this brake lever; that can be thrown up or around this axle [indicating on drawing] without interfering in the least with that brake. To do that would not cost more than $2.50 on each place you moved it.

Mr. FAULKNER. You are not asking him questions. Ask him whether that is so or not.

Mr. VOGT. It is not so.

Mr. STEVENS. Why not have him explain too? He should give his reasons for his answers at the same time.

Mr. VOGT. If that bar which Mr. Andrew wants to apply is put in here [indicating on drawing] in this space it has to come below the rods—the brake rods. The brake rods can not be moved up, because if you do you can not then apply that mechanism to the brake with the power you need to have.

Mr. STEVENS. You could not get the same power?

Mr. VOGT. No, sir. It has to be a different arrangement entirely, which means that we would have to throw away what we have now and use something else instead.

Mr. STEVENS. Is the space there to do the work that he suggests?

Mr. VOGT. Without any change?

Mr. STEVENS. No; supposing that change could be effected.

Mr. VOGT. There would have to be about two inches more space.

Mr. ANDREW. That would be all I want.

Mr. VOGT. The bar is to be 8 inches. Very good. There is 8 inches now available. You can get, perhaps, 2 inches more.

Mr. ANDREW. Yes, sir; that is all I want.

Mr. STEVENS. Ten inches between the top of the rail and the under side of the mechanism?

Mr. VOGT. Yes, sir; but the tires are going to wear, as I have already mentioned. They will be worn down, say, 2 inches, and we have now absorbed all the clearance space that Mr. Andrew wants. Furthermore, the springs settle and let the frame of the locomotive down, and so it will only be a very short time in the life of the engine before those so-called safety wheels, or whatever you call them, will be striking the track.

Mr. STEVENS. In crossings, switches, and frogs, and things of that kind. Is there any allowance for any additional space there, any deflection of the springs which would cause a switch to rise above the brake beam between the wheels?

Mr. VOGT. I don't think I quite catch the point.

Mr. STEVENS. Is there any weight on the wheels to equalize a slight movement of the ends of the roller or beam?

Mr. VOGT. Switches are not made that way to-day, sir. We use what are called "split switches." There are no stub switches any more.

Mr. STEVENS. Then there would be no space needed on that account.

Mr. FAULKNER. What is the least space that the rule allows?

Mr. VOGT. I do not know that there is any general rule.

Mr. FAULKNER. Does not the American Railway Association fix that by a rule?

Mr. VOGT. I do not know whether they have any such rule or not; but we endeavor to make it about 2 or 2½ inches.

Mr. FAULKNER. Two and one-half inches is what I understood to be the rule.

Mr. NEALE. The explanation Mr. Andrew has made about his last patent has not changed your opinion at all as to the conclusion you arrived at after you had examined his first patent?

Mr. VOGT. Not in the slightest.

The CHAIRMAN. Do you make any other objections to this amended patent than those you have explained this morning?

Mr. VOGT. No, sir.

The CHAIRMAN. Then it does obviate some of the objections you made to his original patent?

Mr. VOGT. To what extent?

The CHAIRMAN. Didn't you raise other objections when you were before the committee?

Mr. VOGT. My principal objection was that it prevented the deflection of the axle.

The CHAIRMAN. And that, you think, is not amended any by this?

Mr. VOGT. It is not modified at all by this. In the other one the so-called safety wheels were bolted on to the running wheels. That I objected to because it would necessitate throwing away the wheels we already have.

The CHAIRMAN. Well, any further questions?

Mr. FAULKNER. We would like to introduce Mr. Pilcher now. Will you sit over there, please, Mr. Pilcher, and give your full name and occupation?

STATEMENT OF JOHN A. PILCHER, MECHANICAL ENGINEER, NORFOLK & WESTERN RAILROAD.

Mr. PILCHER. My name is John A. Pilcher. I am the mechanical engineer for the Norfolk & Western Railroad.

Mr. FAULKNER. Were you present at the examination here on this original patent in May last?

Mr. PILCHER. I don't remember the date, but I was present when the examination was made.

Mr. FAULKNER. You testified at that time?

Mr. PILCHER. Yes, sir.

Mr. FAULKNER. Have you had occasion to examine this recent patent, in regard to which Mr. Andrew gave his testimony before this committee a couple of weeks ago?

Mr. PILCHER. I have looked over the patent; yes, sir.

Mr. FAULKNER. Now, Mr. Pilcher, please state to the committee in your own language exactly what, in your judgment, if anything, has been the modification of the views that you expressed as to the former patent.

Mr. PILCHER. In my former remarks I did not dwell upon the points that Mr. Vogt dwelt upon at that time; but, in connection with the device that we have before us now, I would like to reiterate, in a measure, what Mr. Vogt said, and add something to it. First, in reference to the sleeve in the center: That acts as an adjustment in order to set out the auxiliary wheels against the other wheels. This arrangement acts in the nature of a wedge, and if no pressure were brought to bear upon it by drawing the bolts together as shown, this wedge action would only operate at points diametrically opposite on the axle and as soon as the wheel turned at all the other points would not come into operation at all; the wedge itself is made of a roller end and the adjustment is either laterally or longitudinally acting in one direction only. I don't know whether you gentlemen are catching just what I am driving at; but the sleeve itself would have to be a flexible sleeve.

The CHAIRMAN. What part is that?

Mr. PILCHER. That is there in the center portion (of patent drawing, 1043559). Unless that gripping portion was flexible so it would draw tight it would draw tight in only one direction. You understand, that would make a line contact between two spherical surfaces, and when it got into play it would quickly readjust itself by wearing off those small surfaces and become loose, and when it became loose of course it would be ineffective so far as that particular part of the device is concerned.

There is another feature to which Mr. Vogt referred, and that is that all wheels were pressed on the axles without any other fastening. Even allowing that this device could be so adjusted as to bear against these wheels and against the sleeves as soon as the load came on the journals there would be an effort or tendency to readjust themselves to the pressure, and in doing that they would change their form;

it might not be perceptable to the eye, but, nevertheless, a change would take place, and in doing so they would have to exert a pressure against the side of the wheels, which would tend to push them off the axles. In other words, it brings us back to the old axiom, if you pull on a stump the stump will pull as hard as you do. And this factor you can not get rid of through any mechanical means whatever. If those ends react across that axle they will have to react against the wheels.

All railroad companies make an effort to press these wheels on with a definite pressure, for the purpose of keeping them on the axle; but with all the care they give to it, and with the provision of machines to make a record of the pressure, we do not always accomplish what we want to; I don't mean to say that a large percentage of wheels come loose on the axles; but wheels do become loose on axles, due to the fact that perfection can not be arrived at in any field of construction; we can not achieve perfection in dealing with and handling men; we can not devise an absolutely perfect inspection that will provide against accidents under all conditions. I think you gentlemen are fully aware of that fact, that perfection is not arrived at in anything; we get very close, but we miss it a little in everything. And as soon as we put this device on there will be more wheels come loose; I would not say that every wheel would; it depends on the pressure whether an appreciable number would; but I am satisfied there would be more wheels come loose, and that there would be an additional number of accidents.

Now, I am basing my remarks on the supposition that even this thing were practicable. In regard to the covering up of an axle on a truck with a device of this kind I should like to give you the benefit of my experience in designing. As you all know, most modern passenger equipment is mounted on two 6-wheel trucks. This device adds very materially to the diameter, because the sleeve increases the diameter in just that proportion as the thickness of the sleeve. There is nothing in this drawing to show definitely the thickness of the sleeve, but, being acquainted with the general stress that would be placed there, we know that it will have to be considerable to add any stiffness or strength where the loads are—as heavy as they are in our modern passenger equipment.

I made an attempt several years ago to build a 6-wheel truck with 33-inch wheels and an axle—not the largest axle we are using, but what we call the 5 by 9, which is smaller than the axle very often used—and the application of the brake on that 6-wheel truck was one of the most difficult problems we had to deal with. We finally got it on, but then, after it was put on and when it came into operation of the brake and the wheels had worn down, we had to readjust the dimensions of all those brake reverses; we had to make a clearance at one place in order to give the brake levers the proper movement.

Now, imagine what we would be up against in the same connection if we add 2 or 3 inches to the radius of that axle. When I speak of this clearance I mean just as close as it can be worked with safety. So you see this comes down to a reiteration of my former statement with reference to locomotives, to which all of this is just as applicable as to this truck. Without absolutely radical changes in design, of which I could say absolutely nothing at all until a most

consistent investigation was made, this device can not be applied to the modern 6-wheel truck and keep the brake in an efficient condition, as it is with the present design. I wish to modify that when I say as to the present design and say there does not seem to be any possibility of redesigning. A great many people have tried to apply brakes to 6-wheel trucks, but the system in service to-day is the one adopted by railroads all over the country.

This shows you how confined we are in this matter of design in order to get an efficient brake. A great many other things have been tried; and there has been great diversity of design of this particular one, which seems almost the only way to do it.

These auxiliary wheels shown on this design are split into two parts on each side and clamped around the axle. Unless they bear against the wheels themselves and bear hard and fast, and get a good contact all the way around with an even pressure they would not accomplish anything at all. If there was any unevenness of pressure or attempt was made to push those wheels against a surface not true there would be a decided tendency to throw those wheels what we call "out of tram." It would have the same effect as to bind an axle exactly in this way; I mean if the inside wheels were a little broader at one point than at another, the outside wheels, or the operating wheels, would have to take a new set from that on which they were mounted. That would tend to spring the axle, and the car would run as if the car had a bent axle, and we always remove a bent axle as quick as we can when we find it. That is another element of danger that enters into this construction.

Another feature which brings up a reiteration of the former evidence, that any application to a system of mechanism of additional parts, while they may have a good intention, and, in case of properly designed apparatus would be of advantage, necessarily adds another element of danger, because there is something else that something can happen to. I would like to illustrate that a little further: I was talking to a gentleman the other day about labor-saving devices on a locomotive, and while he did not question the advantages of the devices as labor-saving appliances he did question the advisability of putting them on because that added another opportunity for failure of the machine as a whole. And it is so with all these additional appliances. That is the situation we face in this device shown here, or with any other device where we have to add them.

So, in any design we have to consider whether or not, in adding a device in an attempt to make it more safe we are really adding another element of danger.

Mr. STEVENS You admit, then, that there are points of safety in this appliance?

Mr. PILCHER. No, sir; I am not admitting that. I saw a case recently, a scheme where a man put a bar across an opening to an elevator shaft to keep people from walking into it, and then one day he went to see whether the elevator was up or down; he stuck his head over in the shaft to look and the elevator came down on him and it was this very bar that caught his head. Sometimes the very thing you put in as a safety device will be the thing that causes all the trouble.

Now, in regard to the practical workmanship of a device of this kind. It was brought out that in mounting wheels—I don't know

just how it was brought out, but attention was called to the fact that these wheels would have to be machined. They would have to be very accurate machines indeed. The ordinary railroad car wheel, in gauging them up, the gauge test is made from back to back to see whether they will all pass through brackets and guard rails; the actual gauge is from the inside of the throat on one wheel to the back of the flange on the opposite wheel, and even there, from a practical standpoint, we have to allow certain variations simply because wheels are not made and can not be made in foundries under any other process to absolutely one size. So, when we gauge from the throat of one wheel to the back of the flange of the other, and then gauge from the throat of that wheel to the back of the flange of the other it is almost certain that you will not have them identical. We have therefore to allow for this variation.

I am just bringing out these points to show the difficulties which will be encountered in any such an attempt as is proposed with this device.

Now, in regard to the point that was raised in this evidence in connection with the locomotives and the amount of room there is for such a device as Mr. Andrew's. Mr. Vogt's statement, I think, is absolutely correct as to the amount of room there is available. Now, the modern locomotive is no toy. The axles under a modern locomotive run from 10 to 10½ inches in diameter, and on some engines as high as 12 inches. That is a big piece of the very best steel we know how to get hold of from anybody. Now, while we would not positively claim that a device such as proposed to be put under this engine to catch it when it drops should in every case be as big as the axle, yet we must remember that the leverage under which it will have to act causes much greater stress when it drops down onto the rail resting on a good, solid roadbed. These stresses are of such a nature they can not be estimated except upon pure assumptions.

With the limited amount of room available and the necessary clearance that would have to be given for the possibility of a broken spring and the consequent drop of the engine on the boxes, the variation in thickness of the tires due to wear, the necessary clearance that this device would have to be given above the rail for safety, adding these together and deducting them from the available space we would find it possibly reduced to 4 inches. There would be just 2 inches available space under there through which to pass a bar to support this great, large engine, which has already 10-inch axles. And this bar would have to have on the end these rollers. So, you, see, we come down to a possible available space of 2 inches for this bar, which would have to be of a size that a good, big man could bend with a sledge hammer. That, you see, is the practical side of this question.

I don't see how I can make a thing of that kind clearer than I have made it, if I have been followed closely in this connection.

Now, with reference to all these drawings which have been exhibited here, even those brought by Mr. Vogt do not show everything on a locomotive. In the preparation of these drawings, however, he had to make use of information secured from other drawings, on which the other parts of the locomotive, such as the cross bars of the frame, the pedestal caps, valve mechanism inside, etc., were shown, so he could keep clear of them. There is a good deal more on an

engine than is shown by Mr. Vogt's drawings. Therefore this sketch presented by Mr. Andrew, intended to show the possibility of putting this thing in, is just like the Patent Office draftsman's drawing, which is made specifically to show a certain feature. His sketch don't show all the things under there that are in the way.

Mr. NEALE. His drawing is made just to fit this particular case?

Mr. PILCHER. Yes, sir; just to fit the case. That is the feature of all Patent Office drawings; they only attempt to show what they want to show in order to bring out the point in question.

Mr. FAULKNER. And these drawings [indicating the blue prints] are not made for that purpose?

Mr. PILCHER. No, sir; all these blue prints here are working drawings; they have been in the shop, and things have been built by them; they are scale drawings. A man can take this drawing, and but for the slight shrinkage in the paper can build a machine from them; but you can not build a machine from a drawing like this [indicating Patent Office sketch]. It is intended to represent just a special feature and nothing else.

Mr. NEALE. In other words, the man seeking the patent attempts, in his drawing, to illustrate it as favorably as possible?

Mr. PILCHER. I wouldn't say that; he only wants to show what he is trying to patent, and he doesn't care about anything else; but when you are building a machine you have to take into account the space occupied by every bolt, nut, screw, and everything else in connection with the structure. And when gentlemen here, like Mr. Vogt, of a lifetime's experience with railroad work, bring out the fact of these interferences I consider those are strong points.

Now, that question of the drop of a wheel on a wheel on the rail at a distance was brought out before, but I would like to say that such a device has to have some size in order to have the proper strength. Locomotives now carry on the axle, gentlemen tell me, a load of 70,000 pounds in some cases; on our road it is approximately 60,000 pounds; but sometimes it runs up as high as 70,000 pounds per axle. Seventy thousand pounds is four times the capacity of the freight car of 20 years ago. Just think of what that means.

The CHAIRMAN. You maintain that would fall all at once on the bar of iron that is necessary to connect Mr. Andrew's device?

Mr. PILCHER. Yes, sir; we know that device would sometimes have to carry the load of the engine. I will have to go back a little and say that every locomotive is built in such a way that the weight of the locomotive is equalized upon the wheels by a system of leverage so that the center of gravity, which is a fixed feature in any structure, is distributed between the wheels. Now, if any one of those wheels are derailed, and that wheel goes down on the crossties, this leverage protects the engine against excessive loads at any other point. But if this rigid device is fastened to the frame of the locomotive, and the frame carries the main portion of the weight, if that drops down on the rail there is no such equalization, and you may double or treble the load at a certain point. If that drops down there; if that happens at this end [indicating] it will take the load of that end——

Mr. STEVENS. And break the frame?

Mr. PILCHER. Possibility of that. I can not tell in a structure of that kind; the stresses are so complex and so interlocked nobody could say just where the break would be.

Mr. STEVENS. The point you raise is that this would present a new possibility of danger on account of the change of stresses in the structure?

Mr. PILCHER. Yes, sir. This is a point that I have not thought of before in connection with this device, and I am glad it has been brought out. You not only get the possibility of an extra load at a particular point, with changes in stress, but the very drop itself on a solid roadbed; the question of how much force is brought to bear when a thing drops depends entirely upon how sudden it stops. To go down to minutia: If you strike this table with your hand, and there was absolutely no elasticity to the table and none to the hand, the pressure to the hand would be infinite. But that is going down to the furthest theory of it. But there is elasticity to the table and to the hand, and that takes up some of the shock. It is not a question of how high the fall is from, but how fast it is moving when it stops. You can get a practical illustration of that from the operation of railway trains, where we place spring buffers between the cars; there is a record that I know of where a measuring instrument was placed in one of the cars, and the pressure exerted ran up to a million pounds in the stopping of a train. The question naturally arises, how did the parts stand such a shock, and the only deduction you can make is that the elasticity of the car itself absorbed the shock.

Mr. STEVENS. Could any arrangement be made of the frame and different parts so that the application of this device might tend to distribute this enormous strain.

Mr. PILCHER. If we had available space in which to operate; there is always a possibility as to just what the possibilities would be. But we could not tell until a very careful study had been made of every feature of the question. But from what we see now we know that the construction of the modern locomotive, as large as it is, and considering the available space allowed us with respect to the construction of tunnels and bridge clearances to which we are held, would not permit the application of this device, because there is no room for it.

The question was brought out in the other examination as to increasing weights which would add increased weights on the track. We are already up to the limit of what our maintenance-of-way people will allow us to go. In other words, we have forced them to piece out here and there, and we can follow just as rapidly as they increase their structures. So if this thing were applied, it would mean increase in structures all along the route as well as absolutely change the equipment. Then I would like to reiterate my contention that the question of additional appliances will undoubtedly bring about additional elements of danger.

Mr. HAMILTON. Does this change the weight?

Mr. PILCHER. No; it doesn't add to the weight.

Mr. FAULKNER. You mean it doesn't add to the weight of your testimony before?

Mr. PILCHER. It doesn't change the weight of it to any appreciable extent; it is just as in the former case.

Mr. HAMILTON. I remember the testimony, or some of it; but I was wondering whether Mr. Andrew's change of plan would also change the weight.

Mr. PILCHER. This statement of Mr. Andrew's on page 12 (of the hearing of December 17, 1912), the paragraph with reference to the amount of room; I have nothing further to say in regard to that unless there are some questions.

Mr. HAMILTON. You have finished, then?

Mr. PILCHER. Yes, sir; unless there is some question you gentlemen would like to ask.

Mr. FAULKNER. Just a minute.

Mr. PILCHER. Yes; Senator.

Mr. FAULKNER. I was going to ask you the question whether or not this new patent has increased or decreased the danger of the axle breaking?

Mr. PILCHER. I do not know whether it has changed that one way or the other; so far as I can see it has not. Any attempt to put in such a device would accomplish nothing from a practical standpoint.

Mr. NEALE. Your opinion is that the new patent is equally as impracticable as the old one?

Mr. PILCHER. Yes, sir; that the remedy is worse than the disease.

Mr. FAULKNER. Yes; the remedy is worse than the disease.

The CHAIRMAN. How much longer will you gentlemen require? It is past the hour for the meeting of the House, and maybe we had better have you come back at 2 o'clock.

Mr. FAULKNER. I might say, Mr. Chairman, that the testimony we propose to have follow Mr. Pilcher is really corroboration of the statements that these gentlemen have already made. I believe, though, that we can get through in an hour if we run right along with it.

The CHAIRMAN. All right; I will ask Mr. Stevens to take the chair while I go down on the floor of the House.

(Mr. Stevens presiding.)

Mr. FAULKNER. We will try to rush this along and get through as fast as possible. Is there anything further you gentlemen want of this witness?

Mr. STEVENS. Nothing.

Mr. FAULKNER. All right; Mr. Ettenger, will you please take that chair and give your name and occupation?

STATEMENT OF MR. R. L. ETTENGER, MECHANICAL ENGINEER OF THE SOUTHERN RAILROAD CO.

Examination by Mr. FAULKNER:

Mr. FAULKNER. Now, Mr. Ettenger, you were present last May when this matter was before this subcommittee?

Mr. ETTENGER. Yes, sir.

Mr. FAULKNER. You have also examined this new patent suggested not you had reason to change your opinion regarding Mr. Andrew's before this committee in reference to that patent?

Mr. ETTENGER. Yes, sir.

Mr. FAULKNER. Now, will you state to the committee whether or not you had reason to change your opinion regarding Mr. Andrew's inventions; and if not, why not?

Mr. ETTENGER. No, sir; I have not changed my opinion about this device. After an examination of the proposed or changed device, which I have made from a mechanical standpoint, I will say that I believe it is entirely impracticable for reasons that I might describe in just a second with a pencil and piece of paper. [Witness made rough sketch and proceeded.] Those castings here [indicating] are supposed to fit in the wheels on the outside and to be fastened together in the center.

The diameter of this conical surface and the diameter of the inside of this piece of casting is the same at that point only [indicating]; the minute you shove this out [indicating] you change the diameter. You have a round conical bar in here, and your outer bar is of that shape [indicating]. When this change takes place the result is that every time the wheels go over there would be the tendency to move around, and the wear would be very rapid, and this steel construction would soon be so loose and rattling on the axle that it would be a menace to the safety of the whole thing. I believe it is absolutely impracticable.

Mr. STEVENS. You say that couldn't be clamped there because there would be a change in the diameter, which would force that out?

Mr. ETTENGER. The whole idea is wrong; it is not mechanical; the proposition in itself is not a practical one. I would like to make reference to these parts just for a minute. [Referring to blue prints.] It has been the assumption, to some extent at least, that we had a space of 10 inches between these two points [indicating]. Now, this right here is a great piece of iron, 8 inches in diameter, and it goes from this side to the other side, and there is no possibility of putting this device under this frame, of getting through that, or over it, or around it. That is there, and it is bound to be there. That forms a connection from the brake to the frame, and it is impossible to connect something with the frame or to put anything in there, for the space isn't there.

Mr. STEVENS. Is there not a connecting space there back of the brake beam?

Mr. ETTENGER. If you come in here [indicating on blue print], this connects two levers, a shorter one in here; and if you went back far enough behind to come around, you would have to have some sort of gooseneck arrangement, and you could not put a gooseneck in there to hold a locomotive. All I want to say in connection with these brake beams is that there is no possibility of fastening anything to the frame that comes down parallel. These things would have to be large enough to carry a very heavy weight.

I would like to repeat the fact—that has already been mentioned—that these drawings here are working drawings; that they have been actually used in the shop; it shows up here that there have been 312 engines built from these drawings.

Mr. STEVENS. Let me see those patent drawings just a moment.

Mr. HAMILTON. Are not locomotives standardized now? Isn't there but very little variation?

Mr. ETTENGER. We have several different standard sizes—the Pacific type, with three big drivers and trailer and truck; and a con-

solidation engine, with four drivers—each is a type in itself, built for a certain specified work.

Mr. Hamlin resumed the chair.

The CHAIRMAN. Well, Mr. Andrew claims that with the improved arrangement there would be space for it to be applied.

Mr. ETTENGER. Yes, sir; I understand he does; but I say there is not room there for it, and besides, I believe it would be impossible to make a casting of that kind strong enough and large enough to do the service he claims for it.

The CHAIRMAN. I would just like to find out the points of difference between you.

Mr. ETTENGER. One other thing: I had some figures in my former testimony I would like to mention again. This device, to be effective, would have to be on the head of the rail before the balance of the driving wheels struck the ties. Assuming a rail of the ordinary height—the standard height is about 5 inches—the flange of the wheel projects about an inch, or an inch and a half below the head of the rail. That leaves 4 inches from the top of the rail; that would be the height that the rollers of the Andrew device would have to be above the top of the rail so that the safety rollers would rest on the rail before the driving wheels dropped on the ties.

Driver tires are made 3½ inches thick, and wear of 1 inch would reduce their thickness to 2½ inches, and this reduces the height of the frame above the top of the rail. Then there is a flange on the safety wheel of an inch to be taken into consideration, then there is the wear on the springs, and some wear in the hangers, and some wear in the boxes. So, according to the figures made here, the safety wheels, to be effective on a new engine, would be about 1 inch below the top of the rail.

The CHAIRMAN. You mean if the size of the bar should be large enough——

Mr. ETTENGER. No, sir; without any reference to the size, I mean that this device, on a new engine, would hang below the rail before the tires are worn out.

Mr. STEVENS. Does the frame a locomotive sag any?

Mr. ETTENGER. No, sir; because the springs float the frame. The frame is floating up and down on the boxes, which, of course, are attached to the journals. That frame goes down with the springs, however, as they settle and wear, and the tops of the boxes wear; everything has a tendency to go down.

Mr. STEVENS. That is, over the whole space of the frame?

Mr. ETTENGER. Yes, sir; it is practically uniform.

Mr. STEVENS. You calculate that it will go down uniformly?

Mr. ETTENGER. Yes, sir; it ordinarily does. And with uniform wear, with construction as we have it to-day, this device put on so it would be effective on a new engine, would hang below the engine before the tires were worn out.

Mr. STEVENS. Could not the brake be lifted up a little?

Mr. ETTENGER. That would not make any difference, as I see it. You mean as to the tires wearing? In one way, yes. By adding a very large axle, sufficiently strong and made in such a way that you could keep putting on smaller rollers as the tire wore away.

Mr. STEVENS. But that is not a practical thing to do.

Mr. ETTENGER. No, sir; but it is the only possible way, unless by setting screws or bolts which could be raised as the tires wore off.

Mr. ANDREW. That is made just that way, to adjust as you need, right there [indicating on sketch].

Mr. STEVENS. You understand that that was made to adjust as you suggest; that by this device he has, a new adjustment can be made from time to time?

Mr. ETTENGER. Well, I don't see the adjustment that he means; he has something indicated here between the frame and these bearings, but he doesn't show anything there for such adjustment.

Mr. ANDREW. That lower frame there [indicating]; don't you liner that up and down as you want to?

Mr. ETTENGER. Yes; whenever your tire is worn down; but that requires years of service.

Mr. ANDREW. When your tire wears off all you have to do is to use this liner and raise that frame right up.

Mr. ETTENGER. You think you could put a 2½-inch liner in there?

Mr. ANDREW. Yes.

Mr. ETTENGER. I don't think so. That is our point of difference.

Mr. STEVENS. What is the difference betwen you?

Mr. ETTENGER. Why, the difference is this: He speaks of getting liners in there under the frame so they would come into play when the engine was going off the track at speed. The liner proposition would not admit of sufficient strength, fastened to the frame, to make the device effective.

Mr. HAMILTON. So you would have one more element in your mechanism?

Mr. ETTENGER. Not only that. Mr. Andrew shows this device clamped around the frame. If you could clamp it tight it would have an element of strength; but it is just a makeshift to accomplish the purpose in a cheap way.

The CHAIRMAN. Anything further?

Mr. ETTENGER. The engine has no space to put this device on there. If there was nothing else on the engine you might do it, but I think these drawings here show clearly just what the condition is. [Produces additional blue prints, showing engine complete.] I thought it might be of interest to the committee to show the whole engine.

Mr. FAULKNER. I don't suppose you gentlemen care about seeing those drawings?

Mr. STEVENS. What we want is anything new, that has not been presented, which will clear up these points.

Mr. ETTENGER. These are working drawings: they don't show the brakes, but the other drawings do. This shows the frame, the equalizers, etc. This cross section shows what we have in there [indicating], and what you see going in through here. All of these places are represented by big frames that go all the way across. These are absolutely accurate as to measurements down to the slightest fraction of an inch.

Mr. STEVENS. What is that space [indicating]?

Mr. ETTENGER. That is the driving box, and the center of the axle.

Mr. STEVENS. What is that space there, just above the box, in front?

Mr. ETTENGER. That is part of the frame of the engine.

Mr. STEVENS. It looks like a space there.

Mr. HAMILTON. Here is the rim of the wheel; here is that triangle in here; I believe you said that was about an inch in between there?

Mr. STEVENS. He didn't say that.

Mr. HAMILTON. Somebody gave that distance awhile ago—the distance from the rail up to this point and this space between the flanges of the wheels as about an inch or an inch and a half. I have forgotten who it was.

Mr. ETTENGER. Yes, sir. Mr. Vogt spoke of that, but it depends on the diameter of the wheel.

Mr. HAMILTON. I think all this turns largely on what space you have in here.

Mr. ETTENGER. You haven't got any space in there. Here is what is in that space [indicating on other drawing].

Mr. HAMILTON (continuing). Exactly as to the amount of space, whether there is enough space to accommodate this device of Mr. Andrew's.

Mr. ANDREW. It is 22 inches from here to here [indicating].

Mr. HAMILTON. And you claim that that space is occupied by this brake mechanism?

Mr. ETTENGER. Absolutely. With the axle in there, all these things won't have more than 4 or 5 inches there. This is a new engine, of course [referring to drawing].

Mr. HAMILTON. You claim that as the engine sags, due to the wear and settling, that this device of Mr. Andrew's would come below the rail?

Mr. ETTENGER. Yes, sir.

Mr. HAMILTON. And drag on the rail?

Mr. ETTENGER. It would be below the rail.

Mr. STEVENS. And Mr. Andrew claims that he can line it up anywhere he wants to.

Mr. ANDREW. All you have to do is to allow for the wear of an inch and a half on the tire and a wear of three-quarters of an inch on the brass, and when you put your liner there there is a 2½-inch liner, so you can balance it off or build it up, whatever you want. There you are. The difference between that gentleman and myself is nothing more or less than the question of a liner—whether the liner affects the effectiveness of the devise or whether or not the liner is a practical proposition to put in there between the frame of the engine and the safety frame.

I would like to ask the gentleman one question: How long do you calculate that an engine runs before you turn a tire?

Mr. ETTENGER. Well, it depends entirely on conditions; on what shape the tire is in.

Mr. ANDREW. I know; but about the average?

Mr. ETTENGER. They run rarely over a year.

The CHAIRMAN. They are worn out then?

Mr. ETTENGER. No, sir; not over a quarter of an inch.

Mr. HAMILTON. Just what do you mean by "turning a tire?"

Mr. ETTENGER. I mean when the tire gets worn down, and the flange gets sharp it is necessary to turn that tire so as to make it uniform to the track, so as to make it safe.

Mr. HAMILTON. You mean to reverse it?

Mr. ETTENGER. The wheels are taken out and put on a lathe and the tires are reshaped.

Mr. HAMILTON. Exactly; I see.

Mr. ETTENGER. It is then smaller in diameter, of course?

Mr. ANDREW. He says a quarter of an inch; I say a half an inch.

Mr. HAMILTON. Do those same wheels go back on the same engine?

Mr. ETTENGER. Yes, sir; on the same engine.

Mr. HAMILTON. And then the frame is nearer the track?

Mr. ETTENGER. Yes, sir

Mr. ANDREW. And in that same time, Mr. Ettenger, how much will a brass wear, do you think?

Mr. ETTENGER. Anything I could tell you on that question would be a mere generality, because I have not looked that up.

Mr. ANDREW. Of course; but just the average?

Mr. ETTENGER. It would depend on whether the engine was a heavy one or a light one.

Mr. ANDREW. And the service, whether heavy or light, etc., but I mean just the average?

Mr. ETTENGER. It might be a month or several years.

Mr. ANDREW. Well, we will say a half inch to the year; therefore, you would have a year's service without touching that engine, by hanging that 3 inches above to start with. You cover entirely a year's service without a readjustment of those frames. Now, the only question that I can see—and when you take into consideration the object of protecting that engineer and fireman, and the results of derailment—is whether you are justified in making those changes.

Mr. FAULKNER. If the question were simply a question of adjustment that would be done, provided there was a place to put the device where you suggest.

Mr. HAMILTON. It is claimed to be an insuperable difficulty to put this device into this triangular space between these wheels?

Mr. ANDREW. I have shown by these drawings that they can, and they show by Mr. Vogt's drawings that it would necessitate raising their brake mechanism up just 2 inches.

Mr. ETTENGER. I will just repeat that these are working drawings.

Mr. HAMILTON. What do you say to his last statement, that by raising this brake up 2 inches the space left would accommodate his device?

Mr. ANDREW. An 8-inch axle could be accommodated by raising his brake tie-rod, or the draw rods; and I say we could do that work for $2.50 at each place, between each wheel.

The CHAIRMAN. Mr. Vogt said there would be 8 inches of space in there as the engines are now constructed.

Mr. ETTENGER. And with everything new: as it gets old everything is coming down.

Mr. ANDREW. There is 22 inches of space in there, to be specific, just 22 inches of space.

Mr. ETTENGER. Gentlemen, we have 22 inches of space from here to here [indicating on drawing].

Mr. HAMILTON. Is this the point [indicating]? You mean the point of contact of the wheel with the rail up to this point?

The CHAIRMAN. I think they are talking about the distance from the top of the rail up to the lower part of the brake mechanism.

Mr. ANDREW. Well, now, that is what he states—that in here, from here to here [indicating], there was 10 inches. Now, I state that I don't have to go directly under that; it can be raised up.

Mr. ETTENGER. You can not raise it.

Mr. ANDREW. I want to ask you, now, for the information of these gentlemen; that rod runs behind those wheels, doesn't it?

Mr. ETTENGER. Yes.

Mr. ANDREW. What size are they?

Mr. ETTENGER. The rod is 1½ inches at this particular part.

Mr. ANDREW. Now, gentlemen, I am going to show you something, if you will follow me. It is a simple thing. We want to put our axle right in here—right in there [indicating].

Mr. HAMILTON. In front of the brake?

Mr. ANDREW. Either way; now, instead of using—you see that rod over there? Now, I said I could make this change. Here is the coupling and that beam that runs up and down right there. Now, all in the world I have to do is to make a jaw. You see, instead of having that coupled right there I set that back along here [indicating].

Mr. ETTENGER. Set what back?

Mr. ANDREW. Set this connected jaw.

Mr. ETTENGER. You would? But the wheels are in the way.

Mr. ANDREW. This is the way we come out, between the wheels [indicating]. Here we are; there are the wheels.

Mr. ETTENGER. And you just take this brake lever out and put your device in?

Mr. ANDREW. No; I don't touch your brake. I will push this rod over, this one that runs from one end of your engine.

Mr. ETTENGER. Just look inside, will you? That rod isn't alone; it is connected with other rods.

Mr. ANDREW. That is the reason I want to come around this rod; instead of that I will lengthen this right back to here [indicating], and from my jaw coupled right on here. This [indicating], instead of being a straight piece right through, goes down under here [indicating] and over here.

Mr. STEVENS. You put your axle a little in front, a little lower than the brake rod?

Mr. ANDREW. Exactly; he could bend his brake rod, but I can not bend my axle.

Mr. ETTENGER. That rod there that you speak of carries 85,000 pounds; we don't know of any way we can bend these rods around and still have them carry 85,000 pounds weight.

Mr. ANDREW. I can.

Mr. STEVENS. You can not bend the brake rod?

Mr. ETTENGER. I don't only claim that his proposition is entirely impracticable, because he proposes to put two jaws, one over the top and one over the bottom; but by the time we get the bottom jaw wide enough we are in contact with the track below.

Mr. ANDREW. You can make that a circle if you want to, and make it stronger than any other part.

Mr. ETTENGER. But still we go low; suppose you do put your device below this rod [indicating], it is already so low that it strikes the track.

Mr. STEVENS. Why do you have to go below his device?

Mr. ETTENGER. I am just taking his statement.

Mr. ANDREW. Is it practicable to shorten that rod in here?

Mr. ETTENGER. When we design brakes we get these shoes as high as we can; it is designed to give a clearance even when springs break, or when boxes are worn, when journals are reduced in diameter, and when tires are worn down; but we never come lower down than 3 or 4 inches clearance.

Mr. ANDREW. On this drawing here it looks like a very difficult proposition, but just because of the way it is hung here. But all this leverage here, you must bear in mind, all that is on the inside. Now, you see all I have to do is this: I don't have to bother about that rod; I come down underneath that rod with an 8-inch axle. Now, the difference is just here: Are we going to let a 1¾-inch rod stand in the way of a device which will save that entire engine and that engineer and fireman and the life, possibly, of every man on the train if we can put this in there.

Mr. ETTENGER. You mean we can take that rod out?

Mr. ANDREW. No, sir; I don't bother the rod, only to connect these rods around it.

Mr. FAULKNER. Suppose it could be bent, as you suggested, and you put an application of 85,000 pounds stress on that rod, would it strengthen it?

Mr. ETTENGER. It would not.

Mr. ANDREW. I have all the room I want there. This rod from one end of this engine right in through here [indicating] is the only thing that we have to dodge around, just a little 1¾-inch rod stands in our way. They don't need to go to the trouble to bend that rod around if they don't want to. They can make a jaw to fit right here [indicating], and then you have it. You have all the room you need under there.

Mr. STEVENS. What about that jaw arrangement?

Mr. ETTENGER. If we put the jaw on we will come in contact with the track.

Mr. HAMILTON. Would you have the requisite strength if you had these jaws at every one of these axles?

Mr. ETTENGER. I can not see how we could put them on at all. I have not acknowleged that we could put them on at all.

Mr. HAMILTON. Yes; but assuming that they could be.

Mr. ETTENGER. Assuming that they could be, we might make a fastening that would be strong enough to carry that load if there was room enough to put it in I guess we could make it strong enough.

Mr. STEVENS. As to whether the space below is large enough to put that jaw on, and make it strong enough to stand the stress it would have to meet.

Mr. ETTENGER. We might be able to put that one particular feature there, but that has very little bearing on the general proposition of putting in the device.

Mr. FAULKNER. Anything further, gentlemen, with this witness? If not, I will ask Mr. Smith to express his views on this matter now.

STATEMENT OF MR. R. E. SMITH, GENERAL SUPERINTENDENT OF MOTIVE POWER, ATLANTIC COAST LINE.

Examination by Mr. FAULKNER:

Mr. FAULKNER. You have examined this recent patent, have you, Mr. Smith?

Mr. SMITH. Yes, sir.

Mr. FAULKNER. State whether it removes your objections expressed at the previous hearing before this committee last May.

Mr. SMITH. I do not consider that it removes any of the objections that were raised to the original device. I think it really injects an additional objection which ought to have a very great deal of weight with this committee, particularly in the light of the stress that has been placed on safety devices by the Federal Government.

The mechanical engineers who have preceded me have covered this question very fully, indeed, from a mechanical and constructive standpoint, and I hardly think it is necessary that I should go into that feature of it. I would like, however, to say this in regard to that feature: There have been a great many assertions pro and con in regard to what can be done and what can not be done.

With these mechanical engineers of the railroads it is a matter of opinion based upon long designing experience running back over a number of years. In the case of the inventor I really don't know just what experience his positive assertions are based on, or whether he has authority with the wave of a hand to brush aside the objections that are raised by these men of experience. But the questions at issue between them and the inventor can be settled definitely by an experienced draftsman taking the measurements, and with Mr. Andrew at his elbow, if it is necessary; a draftsman could soon show whether or not this device could be put on a locomotive. I don't think years of talk, even, could convince Mr. Andrew of his error; he believes thoroughly that he is right, and he is perfectly honest in his opinion; but I don't see any other way to settle the question, which is certainly far from settled in Mr. Andrew's mind, than the one I suggest.

The feature that I want to call particular attention to appeals to me from an operating standpoint, and that is the application of a heavy casting applied close up against the running wheels encircling the axle and absolutely concealing it and preventing any inspection of the parts which it covers. We have a great many inspectors whose duty it is constantly, day and night, to inspect the running gear of locomotives and freight and passenger cars; it is necessary for them to go under the cars as trains pass through tunnels, and at repair points or when cars are cut out and put on the repair tracks, to examine the wheels and axles, because wheels do become defective. The brakes shown on this print here [indicating] sometimes crack; cracks come in the plates of the wheels—this part here [indicating]; wheels become loose on the axle; you can imagine the axle running along here [indicating on print]. When a wheel is loose it is indicated by the emission of oil or grease, or, if the wheel has actually moved, it will show the movement on the axle. Axles themselves break at times between the wheels. The detection of these defects are matters that receive attention daily, and cars are prevented from going out into trains by the detection of such defects, the cars are shopped, and new wheels or axles applied.

With this device of Mr. Andrew's applied, the inspection for the safety of the wheels and axles is absolutely prevented, and it seems to me that one feature alone ought to condemn this device that is referred to in patent 51192.

I think that is all I care to say.

Mr. FAULKNER. Do you gentlemen desire to ask any questions?

Mr. STEVENS. You have heard the expression of opinion between Mr. Ettenger and Mr. Andrew relative to that jaw, or jacket, or whatever it may be called, on the beams on the locomotive. I would like to ask you if you think that would make any difference as to the inspection. Could they not be sounded or inspected just as well?

Mr. SMITH. I don't understand that this device is intended to be applied to the wheels of locomotives, but to the wheels of cars. This particular device described in the patent referred to is not intended to be applied to the wheels of a locomotive.

Mr. HAMILTON. Well, then, all this discussion was rather aside from the question that we should have been considering.

The CHAIRMAN. Didn't his first patent apply to locomotives?

Mr. SMITH. Yes, sir; but that was fully discussed in the hearing last May; and, as I understood it, the hearing to-day was to be in regard to the patent which has since been brought out to meet the objections raised at that time.

Mr. FAULKNER. I want to say, Mr. Chairman, that we were also answering the statements of Mr. Andrew in reference to this new patent, which applied, of course, to the evidence previously given before this committee by the witnesses for the roads. Mr. Andrew said his new patent changed that objection as to the deflection; therefore we had to go into the evidence that was given on that objection to see whether it had changed the question of deflection.

The CHAIRMAN. Then this new patent does not affect the old equipment on old locomotives? Is that right, Mr. Andrew?

Mr. ANDREW. I was showing them the new patent as applied to the locomotive; they claimed it could not be put on a modern locomotive, and I was showing some of these gentlemen how we did put it on a modern locomotive.

The CHAIRMAN. Well, I see some of us have been laboring under a wrong impression all the time.

Mr. ANDREW. The contention was this, Mr. Chairman: Before Mr. Vogt testified that it interfered with the resiliency or deflection of the axle, and this recent patent was gotten up with the intention of not only meeting or covering those objections, but to make it a part of this wheel—an integral part of this wheel—as far as possible.

The CHAIRMAN. And this recent invention is applicable only to the wheels of a car?

Mr. ANDREW. That is the fact. I contend that I have answered their objections regarding the deflection, and at the same time I make it a perfectly secure proposition in case a bolt or anything should become loose on that tire wheel, because if it were to come loose it could not come back, because this collar locked it; and the wheel itself could not become loose, because it is now an integral part of this wheel and could not get down.

Now, I will remove all this talk about this wheel having a tendency to spread out when I lock that joint there. In the first place that wheel is forced on under a pressure of from forty-five to fifty-five thousand pounds on this axle. Sometimes that comes loose, all right; they certainly do; but now, mind you, we have a beam, a tie beam, on the outside that goes under the journal box around under the brake beam and makes a complete tie from that journal box to the other journal box, and the face of the back of the journal box is

against the face of this wheel [indicating], allowing, of course, for all the lateral play you want. Even if it did have a tendency to go out, it could not amount to anything; not more than an eighth of an inch.

Mr. HAMILTON. You are going into the merits of that device, again, Mr. Andrew, when Mr. Smith still has the floor.

Mr. ANDREW. But you asked me what it was, and I wanted to show you.

The CHAIRMAN. This hearing to-day has nothing in it, then, so far as engines are concerned; or it shouldn't have had.

Mr. ANDREW. It doesn't seem to have.

The CHAIRMAN. You didn't change the device on the engine at all?

Mr. ANDREW. Oh, yes; inasmuch as we have been able to get new patents on this thing all the way through.

Mr. HAMILTON. Do you expect to apply this amended device, or new device, to locomotives at all?

Mr. ANDREW. Certainly I do; certainly I do.

Mr. HAMILTON. That doesn't come out in the hearing of December 17?

Mr. ANDREW. But I have been bringing it out to-day. They claimed we could not put it on a modern locomotive, and I have been trying to show them here how it could be put on a modern locomotive.

The CHAIRMAN. Is your new appliance, or the old one, for modern locomotives?

Mr. ANDREW. Both the same; the one difference is this: With the old type when a locomotive goes off the track it goes on a set of rollers, and the rollers allow it to roll along on the track; but in the case of the modern engine, with the new device, when that goes off the track it goes on the axle proper, and the safety axle proper, and instead of having rollers to roll on it relieves the axle through the medium of this frame that we have to support the engine.

The CHAIRMAN. Go ahead, Mr. Smith.

Mr. SMITH. I think there is nothing more that I care to add, sir. I think the one point I brought out ought to have sufficient weight to condemn the whole affair.

The CHAIRMAN. Anything else, Senator?

Mr. FAULKNER. Yes, sir; we would like to have Mr. Walsh now.

The CHAIRMAN. All right, let's proceed.

STATEMENT OF MR. J. F. WALSH, MECHANICAL EXPERT AND CONSULTING MECHANIC, CHESAPEAKE & OHIO RAILROAD CO.

Examination by Mr. FAULKNER:

Mr. FAULKNER. Will you state to the committee whether you have examined this recent patent, and whether you have changed your opinion given in your evidence in May last as to its practicability as a safety device to prevent derailments?

Mr. WALSH. I have examined the new patent closely and carefully; have listened to the objections made concerning it by the gentlemen preceding me, and I concur most heartily in everything they have said concerning it. And I wish to emphasize, if that is possible, the special points just made by Mr. R. E. Smith, general superintendent of motive power of the Atlantic Coast Line, to the

effect that the application of this new device to the axles of a car or locomotive tender would absolutely cut off every means of inspecting both the wheels and the axles, and would leave railway companies and the public in great danger from possible failure of those parts.

Mr. Andrew, just a moment ago, went on to say that those wheels were pressed on the axles at a pressure of forty-five or fifty-five thousand pounds. Now, those wheels are pressed on under a pressure of from 40 to 60 tons, and in spite of that they sometimes become loose.

With this device applied as it is proposed to apply it, you would have absolutely no means of determining whether the wheel was loose or not. Again, with this device applied, considering the well-known vibration of the axle due to the weight on the journal, the effect of this tightly fitted sleeve between the wheels would certainly result either in forcing the wheels off the axle or in breaking the axle right close to the wheels.

Now, I don't know, Mr. Faulkner, that I have anything further to say on the subject; but I concur most heartily in all that has been said here concerning this matter.

The CHAIRMAN. Any questions to ask Mr. Walsh?

Mr. FAULKNER. Then, as I understand you, Mr. Walsh, you regard this new device as really more dangerous in its application because of the danger of the breaking of the axle or forcing off the wheel than the former device?

Mr. WALSH. Exactly; and because it would absolutely cut off from inspection every axle, or the wheel.

Mr. STEVENS. You could not inspect it from the outside?

Mr. WALSH. Not for a loose wheel. The oil box on the end of the axle will prevent them seeing that; but on the inside of the wheel, where there is ordinarily no chance to see, you would have to depend on the oil seeping through there, in case of a loose wheel, and that is practically the only means of determining it. The wheel may be loose and it may have worked back and forth on the axle, and when the train came to a standstill it might be right back in its original place; but if we see oil seeping through there we know that fit has become loose, and consequently, by this means, we can readily determine when wheels are loose. But you cover it up with this proposed sleeve and this auxiliary wheel and that would be out of the question; you could not see it at all.

The CHAIRMAN. Any other questions?

Mr. FAULKNER. We have nothing more, Mr. Chairman. I said I thought we would get through in an hour.

Thereupon, at 1 p. m., the meeting of the committee was adjourned.